

BEST AVAILABLE COPY**REMARKS**

This Amendment and Reply seeks to place this application in condition for allowance. Several of the claims have been amended to correct inadvertent typographical errors, to improve grammar and/or clarity, to more fully claim the inventions, and/or to more definitely set forth the features of Applicants' invention(s). No new matter has been added.

In the Office Action of August 20, 2004 (hereinafter the "Office Action"), nearly all of the claims have been found to contain patentable subject matter. Several of the claims were rejected. All of the objections and rejections raised in the Office Action have been addressed herein. Each of the objections and rejections are addressed in detail below.

Amendment to the Claims

Certain claims have been amended to correct inadvertent typographical errors, to improve grammar and/or clarity, to more fully claim the inventions, and/or to more definitely set forth the features of Applicants' invention(s). No new matter has been added. Moreover, none of the amendments were motivated by patentability considerations in view of the prior art, including the art relied on in the outstanding Office Action.

Notably, claims 51 and 94, as amended, recite a substrate having a wafer or wafer-like shape. The specification, on page 9, lines 9-16 and on page 12, pages 3-10 (among others), describes the substrate, in one embodiment, having a wafer or wafer-like shape:

In one embodiment, the EIW is a wafer or wafer-like object. When the EIW is a wafer-like object, the EIW may have a different physical form factor than a product wafer. The processing equipment, however, may handle such an EIW without adverse modification to its hardware and/or software. For example, where an EIW includes circuitry, sensors and/or sources to monitor a CVD process, the EIW may have the same or substantially the same planar size and shape as a product wafer, but may be (slightly) thicker. As such,

the EIW "behaves" like a thick wafer and the deposition equipment may handle the EIW with little or no modification to the equipment. ('142 app., page 9, lines 9-16).

The Sensor-EIW may also include circuitry and components that protrude from the surface, hence creating a portion that includes a non-flat surface topography. The circuitry and components are disposed on a wafer-like object that may be handled (automatically or manually) within the equipment. Thus, such an EIW includes a substrate that has a similar form factor and/or profile as a product wafer ('142 app., page 12, lines 3-10).

Again, none of the amendments were motivated by patentability considerations in view of the prior art, including the art relied on in the outstanding Office Action.

Rejection of the Claims under 35 USC § 103

In the Office Action, claims 51-56, 61 and 66 were rejected as being unpatentable over Wataya (U.S. Patent Application Publication US 2003/0080434) in view of Avanzino et al. (U.S. Patent 6,562,185). In this regard, the Examiner states "it would have been obvious ... to modify Wataya to sample the processing equipment during processing, as taught by Avanzino et al., because this process would allow for precise characterization and control of the manufacturing process when fabricating devices on a micro-miniature scale (See Wataya, paragraph 9, lines 1-7)." (Office Action, page 4).

Applicants respectfully disagree. For at least the reasons set forth below, none of the claims are obvious based on Wataya in view of Avanzino et al.

Wataya

Wataya describes a solid image-pickup device 2 for a digital still camera or the like. (Wataya, paragraph 36, lines 1-2; and paragraph 34, lines 1-5.) The Wataya solid image-pickup device 2 includes, among other things, a plurality of light sensors arranged in

an image pick-up area 14, which is in a central area of the surface 12 of a semiconductor substrate 10. (Wataya, paragraphs 24 and 25). A transparent plate 6 (for example, quartz) is disposed on the light sensors to cover the sensors. (Wataya, paragraph 32, lines 1-5). The solid image-pickup device 2 includes:

a size that is exactly the same size as the semiconductor substrate 10.

Further, the thickness of the device includes on the thickness of the transparent plate 6 and the semiconductor substrate 10. For this reason, it is possible to greatly reduce the size of the solid image-pickup device 2, especially the thickness thereof. (Wataya, paragraph 32, lines 9-14).

In this way, according to Wataya, "it is possible to obtain an improved thickness-reduced image-pickup device including an external circuit (flexible circuit substrate 8)." (Wataya, paragraph 33, lines 6-9). Moreover, "it is possible to incorporate the solid image-pickup device into the camera in an accurate positioning process with a high precision." (Wataya, paragraph 36, lines 5-7).

Thus, in sum, Wataya describes nothing more than a thickness-reduced image pickup device that may be positioned in a camera or the like with high precision in a shorter time than conventional image pickup devices. (See, for example, Wataya, paragraph 36).

Avanzino et al.

Avanzino et al. describe a system for characterizing a chemical mechanical polishing ("CMP") process (i.e., a surface planarization technique in which high elevation features are selectively removed, via a polishing pad, resulting in a topology with improved planarity) (See, Col. 6, lines 3-11). Avanzino et al. employs a wafer including, among other things, one or more temperature sensors in or on the wafer to permit monitoring of the wafer's temperature when undergoing chemical mechanical polishing processing. (See, Col. 7, lines 27-32 and Figures 3, 4, 5, 6, 9 and 12).

In addition to the wafer, the Avanzino et al. system also includes a temperature monitoring system and a CMP system. Briefly, the temperature monitoring system takes temperature readings from the temperature sensors in or on the wafer. (See, Col. 5, lines 20-23, Col. 8, lines 64 to Col. 9, lines 26; and Figures 1 and 7).

The CMP system of Avanzino et al. performs the chemical mechanical polish of the wafer. (See, Col. 5, lines 18-19, Col. 11, lines 5-23, and Figure 8). While performing the polishing process, the CMP system records information associated with pad, slurry, pressure, and motion information. (See, Col. 6, lines 16-48). The CMP system may also correlate such information with the temperature readings provided to the CMP system by the temperature monitoring system. (See, Col. 8, lines 27-31).

Notably, the pad, slurry, pressure and motion information appears to be obtained from the CMP system. Such information does not appear to be provided by or from any sensor(s) disposed on or in the wafer. Indeed, temperature sensors appear to be the only sensors disposed in or on the wafer. (See, Col. 5, lines 1-2, 46-51, Col. 7, lines 27 to Col. 8, line 48; Col. 11, lines 58-61; Col. 13, lines 43-57; and Figures 3-6 and 12).

The Avanzino et al. system also describes a CMP control system "to analyze temperature information, other information (e.g., pad, pressure, wafer, slurry, motion) and relations between such information to control the CMP system". (Col. 9, lines 52-56; and Figure 7). In this regard, in the event a desired temperature is not achieved, the CMP control system "adjusts one or more CMP parameters (e.g., slurry dispense rate, pressure) to facilitate achieving such a desired temperature." (Col. 9, lines 58-63). As such, the CMP control system may adjust the operation of the CMP system based on the temperature.

Independent Claim 51

Independent claim 51, as amended, describes an EIW unit for use in sensing a parameter of a surface structure that is formed on the EIW unit by integrated circuit processing equipment. The integrated circuit processing equipment is used to manufacture integrated circuits.

The EIW unit comprises a substrate having a wafer or wafer-like shape. The EIW unit also includes a plurality of sensors, disposed on or in the substrate, to sample the process parameter of the surface structure that is formed above the sensors and on the EIW unit by the integrated circuit processing equipment during performance of an integrated circuit manufacturing process.

Thus, the integrated circuit processing equipment, during processing, forms the surface structure on the EIW unit and above the sensors. The sensors, which are disposed on or in the substrate, sample the process parameter of the surface structure, which is being or was formed during performance of the integrated circuit manufacturing process.

**Wataya Neither Anticipates, Nor Renders
Obvious the Claimed Inventions**

There are many inventions described in the instant application. In an effort to present a more concise response, the discussion below focuses on only selected aspects or features of the rejected independent claim, namely claim 51. These are not the only reasons the inventions of the rejected claims are patentable over Wataya alone or in combination with Avanzino et al.

Moreover, many of the claims that depend from independent claim 51, as noted by in the Office Action, present patentable subject matter. Those dependent claims are not discussed in detail herein. Further, the rejected dependent claims (namely, claims 52-56,

61 and 66) also present patentable subject matter beyond that discussed herein. Those rejected dependent claims are also not discussed in detail herein.

As such, Applicants' response to this rejection is not exhaustive by any means; rather, for the sake of brevity, the remarks focus on only some of the patentable aspects or features of the independent claims.

Notably, many of the reasons that independent claim 51 is patentable over Wataya, alone or in combination with other art, are also applicable to allowed claims 71-115. For the sake of brevity, the remarks immediately below focus on only some of the patentable aspects or features of the independent claim 51; the other independent claims (namely, claims 71 and 94) are not specifically discussed in detail herein.

Wataya Does NOT Render Obvious Claim 51

Wataya does not teach or suggest an image sensor for or disposed in an EIW unit. Wataya also does not teach or suggest an image sensor for use in sensing a parameter of an integrated circuit process – let alone sensing a parameter of a surface structure that is formed on the EIW unit by integrated circuit processing equipment. Rather, Wataya describes nothing more than a compact image sensor for use in a digital camera or the like. (Wataya, paragraph 36, lines 1-2; and paragraph 34, lines 1-5.). That is, the Wataya image sensor is nothing more than a thickness-reduced image pickup device that may be positioned in a camera with high precision and in a shorter time than conventional devices. (See, Wataya, paragraph 36).

Thus, Wataya does not teach or suggest:

- use of Wataya thickness-reduced image pickup device on or in an EIW unit;
- use of its image pickup device on or in any platform or substrate for use in integrated circuit processing equipment; and

- an image sensor to sample a process parameter of the surface structure that is formed above the sensors and on the EIW unit by the integrated circuit processing equipment.

Avanzino et al. provides no help. There is absolutely no suggestion or motivation to one skilled in the art to combine the Wataya thickness-reduced image pickup device with the Avanzino et al. wafer. The Avanzino et al. wafer samples only temperature. There is nothing in Avanzino et al. that would motivate one skilled in the art to sample a parameter (other than temperature) since the Avanzino et al. CMP system appears to employ only temperature data to determine whether "to update one or more CMP parameters (e.g., pressure, speed, slurry properties)" (Avanzino et al., Col. 10, line 62 to Col. 11, line 4; See also, Col. 14, lines 38-48 and Figures 10, 11 and 13). The Avanzino et al. system does not contemplate an additional type or types of sensors on the wafer to sample a process parameter that is different from temperature.

Even assuming, for the sake of argument, the Wataya image sensing device was implemented on the Avanzino et al. wafer, that combination would still not provide the invention of claim 51. First, it is unclear what process parameter the Wataya image sensing device would sample. This notwithstanding, the Wataya image sensing device would not sample a process parameter of the surface structure formed above the Wataya image sensing device by the integrated circuit processing equipment (here, the CMP equipment of Avanzino et al.). Indeed, were the Wataya image sensing device implemented on the Avanzino et al. wafer, the CMP equipment would likely remove, damage or destroy the Wataya image sensors and/or transparent plate 6.

In sum, Wataya does not teach or suggest the invention of claim 51. Moreover, there is nothing in Avanzino et al. that would motivate one skilled in the art to include the

image sensor of Wataya to sample a process parameter of the surface structure that is formed above the Wataya image sensors and on the EIW unit by the integrated circuit processing equipment during performance of CMP process. Even assuming, for the sake of argument, the Wataya image sensor was implemented on the Avanzino et al. wafer, that combination would still not provide the invention of claim 51.

Dependent Claims

Many of the claims dependent on claim 51 have been found to include patentable subject matter. Applicants provide no additional comments pertaining thereto.

As for the rejected dependent claims, for the sake of brevity, the additional reasons those dependent claims are patentable over Wataya, alone or in view of Avanzino et al. are not set forth herein. However, for at least the reasons stated above, it is respectfully submitted that such rejected dependent claims present patentable subject matter.

Allowable Subject Matter

Claims 57-60, 62-65 and 67-70 have been found to contain allowable subject matter but were objected to as being dependent upon a rejected base claim. (Office Action, page 4). In view of the remarks above, Applicants respectfully submit that these claims, without more, are allowable.

Claims 71-115 were allowed. (Office Action, page 4). Applicants note the statement of reasons for the indication of allowable subject matter. (Office Action, pages 4-5). No inference or conclusion should be drawn that Applicants believe that the Examiner's reasons for allowance are the only reasons the claims are patentable. Indeed, the Examiner's statements focus on two independent claims and no mention is made with the

dependent claims, which include other and/or additional inventive aspects. Thus, Applicants interpret the Examiner's statement to be in no way exhaustive.

Moreover, although Applicants agree with the Examiner's ultimate conclusion that the inventions, as claimed, are patentable over the prior art, as described in the above-referenced application, there are many inventions described and illustrated therein. Indeed, other inventions described and illustrated in the application may or may not include one, some or all of the features set forth in the Examiner's statement.

Prior Art Made of Record

Applicants note the prior art made of record but not relied upon. It is not clear what is meant by the comment that the prior art made of record "is considered pertinent to applicants' disclosure." (See, Office Action, page 5, ¶ 4). No inference or conclusion should be drawn that Applicants agree, in any way, with the Examiner's characterization of such prior art. In an effort to provide a more concise response, and because the Examiner has not rejected any of the claims based on the prior art made of record (but not relied upon), Applicants do not provide comments on the Examiner's characterization.

Third Information Disclosure Statement

Applicants submitted a Third Information Disclosure Statement ("IDS"), including Form PTO-1449, on July 30, 2004. A copy of that Third IDS is attached hereto. The Third IDS was received by the USPTO on August 3, 2004. (See, Stamped Postcard).

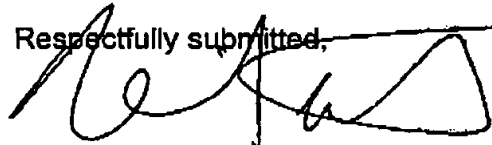
The Office Action did not include an indication that the Third IDS was considered by the Examiner. As such, it is again respectfully requested that the Examiner make his consideration of the reference identified in that IDS formally of record with the next action.

CONCLUSION

Applicants respectfully request entry of the foregoing amendment and reconsideration of the instant application. Applicants submit that all of the pending claims present patentable subject matter. Accordingly, allowance of all of the claims is respectfully requested.

It is noted that should a telephone interview expedite the prosecution of this application in any way, the Examiner is invited to contact the undersigned at the telephone number listed below.

Respectfully submitted,



Date: November 10, 2004

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